

What is claimed is:

1. A porous ceramic support for a gas separation membrane formed by sintering a green body containing refractory grains of at least one simple or compound ceramic oxide and grains of at least one reactive binder precursor, wherein:
 - a) the coefficient of thermal expansion of the refractory grains is greater than about $8 \times 10^{-6}/^{\circ}\text{C}$;
 - b) the grains of the reactive binder precursor are reacted with at least one gaseous, liquid, or solid phase reactant to form a reaction bond to bind the refractory grains; and
 - c) the mean pore size of the support is greater than about 1 micron.
2. The support of claim 1 in which the support is sintered in an oxidizing atmosphere.
3. The support of claim 1 in which the support configuration is selected from the group consisting of multi-channel monoliths, tubular elements, hollow fibers, and plate structures.
4. The support of claim 1 in which the size of the refractory grains is in the range of about 5 to about 200 microns.
5. The support of claim 1 in which the refractory grains are selected from the group consisting of alumina, titania, zirconia, magnesia, forsterite, spinel, and mixtures thereof.
6. The support of claim 1 in which the change in volume of the sintered ceramic support from that of the green body is less than about 5%.
7. The support of claim 1 in which the reactive binder precursor contains grains

of an element.

8. The support of claim 7 in which the element is selected from the group consisting of aluminum, silicon, titanium, zirconium, and mixtures thereof.

9. The support of claim 1 in which the reactive binder precursor contains grains of at least one ceramic compound.

10. The support of claim 9 in which the ceramic compound is selected from the group consisting of alumina, silica, titania, zirconia, magnesia, and carbides and nitrides of silicon, aluminum, zirconium, and titanium.

11. The support of claim 1 in which the grain size of the reactive binder precursor is less than about 10 microns.

12. A porous, ceramic, multi-channel monolith gas separation membrane support formed by sintering a green body containing refractory grains of at least one simple or compound ceramic oxide and grains of at least one reactive binder precursor, wherein:

- a) the coefficient of thermal expansion of the refractory grains is greater than about $8 \times 10^{-6}/^{\circ}\text{C}$;
- b) the pore size of the monolith support is in the range of about 1 to 50 μm ; and
- c) the volume change of the monolith support during sintering is less than about 5%.

13. A method of forming a porous membrane support of ceramic oxide material, comprising;

- a) making a mixture containing refractory grains of at least one simple or compound ceramic oxide with a coefficient of thermal expansion greater than about $8 \times 10^{-6}/^{\circ}\text{C}$ and grains of at least one reactive binder precursor;

- b) forming the mixture into a green body;
- c) sintering the green body to react the grains of the reactive binder precursor with at least one gaseous, liquid, or solid phase reactant to form a reaction bond to bind the refractory grains; and
- d) cooling the sintered body.